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GAS ABSTRACTS

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CONTENTS

1. Gas Industry 77
2. Appliances 78
3. Combustion and Industrial Furnaces 78
4. Carbonization and Gasification 79
5. Natural Gas and Natural Gas Condensates 81
6. Petroleum and Synthetic Liquid Fuels 85
7. Analytical Methods and Tests 87
8. General and Physical Chemistry 89
9. Organic Chemistry 91
10. Chemical Engineering 91
11. Process Equipment and Instrumentation 93
12. Materials of Construction 94
13. New Books 96

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1. GAS INDUSTRY

Bureau of Standards

A REPORT ON THE PRESENT FUNCTIONS AND OPERATIONS OF THE NATIONAL BUREAU OF STANDARDS. *Science*, **119**, 195-200 (1954) February 12.

The October 15th report of the Special Science and Technology Committee to the Secretary of Commerce specifies that: 1) the Bureau of Standards is vitally important to national strength. 2) Its functions include determination of physical constants, properties of materials, standards, and testing-evaluation procedures. 3) Its basic science program must be expanded to meet the nation's needs. 4) Weaponry projects should be transferred to Dept. of Defense. 5) More government agencies should use services of Bureau. M. A. Klosse

Canadian Gas

Yorath, D. K. WHAT LIES AHEAD? *Can. Gas J.*, **47**, 11-13 (1954) February.

The future of Canadian natural gas is discussed, with consideration of the problems arising presently and in the future when large scale pipeline construction is possible. R. F. Bukacek

Phillips: Regulation

Crosby, S. H. GAS REGULATION BY COMPACT? PART I. THE PHILLIPS DILEMMA. *Public Utilities Fortn.*, **53**, 90-98 (1954) January 21.

The refusal of the U. S. Supreme Court to entertain an appeal in the controversial Phillips Petroleum Case took a good many observers by surprise. Here are reasons why the natural gas producers must take a long-range view towards stabilizing their operations in the light of prevailing and prospective regulatory law. Is gas regulation by compact the answer to the "Phillips law. Is gas regulation by compact the answer to the Phillips dilemma?"

Author's Abstract

Crosby, S. H. GAS REGULATION BY COMPACT? PART II. USING THE COMPACT TECHNIQUE. *Public Utilities Fortn.*, **53**, 161-168 (1954) February 4.

The recent action of the U. S. Supreme Court in agreeing to review the celebrated Phillips Case defers but does not eliminate the problem of eventual exercise of regulatory jurisdiction over natural gas production, which the lower court said should be exercised by the Federal Power Commission. Here is a suggestion that a solution to the problem of federal versus local regulation of natural gas production and gathering may be found through appropriate use of the interstate compact commission form.

Author's Abstract

Gas in 1953

NATURAL GAS PRODUCTION AND USE. *World Oil*, **138**, 154, 156, 158, 160 (1954) February 15.

The U. S. natural gas industry continued its amazing growth during 1953 by marketing 8.7 trillion cubic feet, an increase of 700 billion cubic feet over 1952. In line with the increase in production the well-head price of gas advanced from 7.8 cents per MCF in 1952 to 8.3 cents in 1953. The number of natural gas customers at the end of 1953 is estimated at 20,611,000, up 6.5 percent from the end of the previous year. Data on natural gas production, types of consumption, and other data since 1936, and marketed production by states since 1906 are presented. B. E. Eakin

Statistical Design

Youden, W. J. STATISTICAL DESIGN. *Ind. Eng. Chem.*, **46**, 107A-109 (1954) February.

Plans and programs are announced for a new bimonthly column on statistical design in the *I. & E. C. Production Forum*. The great growth of interest in statistics among chemists is reviewed. The aid of fellow associations in dissemination of statistical information is acknowledged, and the need for education of chemists in these techniques is emphasized.

O. P. Brysch

2. APPLIANCES

Fuel Consumption Estimates

Strock, C. THE DEGREE-DAY—A FUEL ESTIMATING UNIT. *Heating and Ventilating*, 51, 102-118 (1954) March.

A definition of the degree-day is given together with a discussion of the validity of the 65° base value. Its principal uses in comparing and predicting fuel consumption are also discussed. The following three sets of tables are presented: 1) variations in monthly degree-days in six cities, 1899-1953. 2) normal degree-days by months for U. S. cities, and 3) normal yearly total degree-days for 877 U. S. cities.

R. Parker

Gas-Electric Comparison

Turner, C. C. YOUR ANSWER TO BELTSVILLE. *LP-Gas*, 14, 35-37 (1954) March.

Technical Bulletin 1073 of the U. S. Department of Agriculture giving comparison of LP-gas and electric appliance efficiency has aroused a great deal of discussion. These tests were slanted strongly in favor of electric appliances. (See also *Butane-Propane News*, March 1954, pp. 33-41.) E. F. Searight

Heat Pump Progress

HEAT PUMP MOVES FORWARD. *Heating and Ventilating*, 51, 119-123 (1954) March.

This article abstracts four papers on heat pumps presented at the Winter General Meeting of the American Institute of Chemical Engineers. These articles are: 1) The Residential Heat Pump; 2) Performance of an Earth Source Heat Pump; 3) Advancement in Program; 4) Discussion on Residential Heat Pump Development. E. F. Searight

Space Heating

Schutrum, L. F., Humphreys, C. M. EFFECTS OF NON-UNIFORMITY AND FURNISHINGS ON PANEL HEATING PERFORMANCE. *Heating, Piping and Air Conditioning*, 26, 122-130 (1954) February.

Two previous papers have reported the results of experiments conducted in the ASHVE Environment Laboratory dealing with heat exchanges in a panel heated room under the rather idealized conditions of uniform surface temperatures and no furnishings. This paper reports the results of work done in the Environment Laboratory to evaluate the effect of non-uniform surface temperatures, floor coverings and room furnishings. The results are expressed as corrections which may be applied to the results given in the earlier papers.

Authors' Abstract

Water Heating

Jenkins, G. F. SELLING WATER HEATING. *Gas Times* (British) 78, 101-103 (1954) January 22.

Argues the necessities of domestic uses for gas with special concern toward water heating. Water heating should be the chief source of expansion in the gas industry. Discusses gas as a more economical fuel in use of the nation's resources as well as cost to the individual.

J. R. Boyd

3. COMBUSTION AND INDUSTRIAL FURNACES

Billet Furnace

Hess, F. O. (assigned to Selas Corp. of America) FURNACE SYSTEM. U. S. 2,668,040 (1954) February 2.

The invention relates to a particular system for heating simultaneously in a single furnace a plurality of billets with means for obtaining individual control of each billet while it is being heated. J. G. Chalcraft

Flame Research

Belles, F. E. and Simon, D. M. EFFECTS OF ADDITIVES ON PRESSURE LIMITS OF FLAME PROPAGATION OF PROPANE-AIR MIXTURES. Nat. Adv. Comm. Aero. RM E53I29 (1953) December 18.

Seven additives in 0.5-volume-percent concentration were studied for their effects on the low pressure limits of flame propagation of propane-air mixtures. The limits were measured in a flame tube of new design; mixtures containing

approximately 2 to 8 percent propane by volume were studied. The limit curves were without lobes on the rich side and were closely related to quenching-distance data measured by the flash-back of a Bunsen burner.

J. G. Chalcraft

Schalla, R. L. EFFECTS OF DIFFUSION PROCESSES AND TEMPERATURE ON SMOKING TENDENCIES OF LAMINAR DIFFUSION FLAMES. Nat. Adv. Comm. Aeron. RM E53J12 (1953) December 15.

The effects of diffusion process on the smoking tendencies of eight laminar diffusion flames were investigated by varying the rate and concentration of air and oxygen supplied to the flame. Increasing the air rate permitted rather limited increases in the smoke-free burning rate. Increasing the concentration of oxygen from 21 to 45 percent increased the smoke-free fuel flow for pentene-1, neopentane, isobutane, ethylene, and *n*-butane, but decreased the smoke-free burning rate for butene-1, cyclopropane, and propene in the range of 25 to 40 percent oxygen. J. G. Chalcraft

Flue Gas Dew-Point

Fearn, G. A., Jr. and Tessin, C. W. THE INFLUENCE OF SULFURIC ACID UPON THE DEW-POINT OF COMBUSTION GASES. *Combustion*, 25, 45-48 (1954) February.

The authors show how the highest dew-point of the combustion gases from sulfur-bearing fuels may be predicted. The method is developed from a consideration of basic equilibrium data. Authors' Abstract

Industrial Gas

Ackerson, C. HOW GAS PERFORMS EVERYDAY JOBS. *Ind. Gas*, 32, 8-10 (1954) February.

Softening materials for moving pipes; soldering and brazing; glass forming; fuel oil heating for steam applications; heating of solutions; heat treating of small-diameter steel tubing; heating interior of rotating drums; these are a few of many invaluable uses.

Author's Abstract

Toxic Hazards

Berger, L. B. and Schrenk, H. H. DANGER FROM CARBON MONOXIDE IN THE HOME. U. S. Bur. Mines Inform. Circ. 7676 (1954) February.

Carbon monoxide dangers from use of fuel burning appliances are discussed. Several excellent suggestions are made, but a number of points are in conflict with A.G.A. approval requirements. Most notable of these are a danger limit for CO of 0.01 percent, and a suggestion that all range ovens be vented.

E. F. Searight

Schrenk, H. H. INDUSTRIAL HYGIENE. *Ind. Eng. Chem.*, 46, 101A-103A (1954) February.

Review of literature for 1953 on hazards, limits and treatment of lead and mercury poisoning, insecticides, sulfur dioxide and noise levels upon human and animal subjects.

G. V. Vosseller

Waste-Gas Combustion

Reed, R. D. SMOKELESS BURNING OF WASTE PROCESS GASES. *Amer. Soc. Mech. Eng. Trans.*, 76, 251-253 (1954) February.

Discusses the problem of burning off emergency dumps from process gases. Includes the general idea of necessary conditions for smokeless combustion with a discussion of the methods used to combat the problem of smoke.

M. Quinn

4. CARBONIZATION AND GASIFICATION

Coking Research

Barritt, D. T. and Kennaway, T. NEW CARBONIZING PROCESSES. *Gas J.* (British) 277, 152-55, January 20; 219-21 (1954) January 7; *Gas World* (British) 139 (*Suppl.*) 23-34 (1954) February 6.

General features of coke oven design and the inherent limitations of coke ovens are discussed as a prelude to an appraisal of three coking processes now in the course of development. Of these, which were mentioned in an earlier OEEC Report (see *Gas Abs.* 9, 202), the first installment of the article examines the National Fuels Process (National Fuels Corp.—American Cyanamid Co.) Pilot-plant tests (100-ton) indicate the fundamental features of the oxidation of the pulverized coal, the use of a suitable binder for briquetting, and the control

of the rate and manner of heating (350-900°C.) the briquets passing through the shaft retort. Advantages claimed over the coke-oven are 1) adaptability to a wide range of coals (weakly caking), 2) great strength and uniform size of product, 3) flexible operating rate, 4) dry-quenching and heat recovery, 5) higher thermal efficiency, 6) lower initial plant costs. These are offset to some extent by the costly grinding, drying, oxidizing and briquetting operations. Similar advantages are claimed for the Brennstoff-Technik and the Baumco processes, in the second installment. The former operates on the principle that the higher the rate of heating, the greater the plasticity (and the temperature range of plasticity) so that coals weakly-caking in usual coke-ovens are successfully carbonized, without pretreatment or briquetting. This is achieved batchwise by using narrow chambers (60-125 mm) between metallic heating walls at 650° C., which are pivoted to swing apart at the bottom to allow coke discharge. A plant at Marienau (Saar) produces 154 tons coke per day. The second (Baumco) process utilizes low-or-non-coking coals, first devolatilizing at 800° C., then briquetting the char with 10% pitch and 10% coking coal. The briquets are carbonized continuously at 800° C. in a vertical shaft by both direct and indirect heating, and quenched internally. Success of such processes on weakly caking coals would have world wide significance in the fuel and metallurgical industries. O. P. Brysch

Dryden, I. G. C. and Griffith, M. PHYSICAL AND CHEMICAL FACTORS IN THE EARLY STAGES OF COKE FORMATION. (BCURA Review No. 134) *Brit. Coal Utilis. Res. Monthly Bull.*, 18, 62-86 (1954) February-March.

Behavior of coals during carbonization up to the end of the plastic range (500° C.) is reviewed with emphasis on the mechanisms of change in the solid phases. Good coking coals may be regarded as those coals for which the temperature of incipient softening is lower than the temperature at which decomposition to gas and vapor becomes rapid. Studies on the factors which determine softening and decomposition are cited from 180 references, and the data needed for more complete understanding of these mechanisms are outlined. O. P. Brysch

Gayle, J. B. and Gulledge, E. L. EFFECTS OF VARIATIONS IN BULK DENSITY ON COKING TIME. U. S. Bur. Mines Rep. Invest. 5027 (1954) January.

Results of 32 tests in the ½ ton capacity, experimental coke oven at the Tuscaloosa Station, Bureau of Mines are graphed to show effects of bulk density, moisture, and oil blending. A simple linear equation: Coking Time = 0.2914 Bulk Density — 0.75,—predicted the coking time with a probable error of 14 minutes. Effects on "soaking" time and throughput are discussed. O. P. Brysch

Hadzi, D., Kavcic, R. and Samec, M. UEBER DAS VERKOKEN NICHTBACKENDER KOHLEN. (ON THE COKING OF NON-CAKING COALS). *Brennstoff-Chemie* (German), 35, 44-47 (1954) February 17.

The coking mechanism of several organic compounds of known simple structure has been reported from Jugoslavia. Dinaphthyl sulfone (beta-beta) for example on slow heating yields a strongly coking pitch. Likewise the quinones, such as 1-2-naphthoquinone, 4-oxynaphthyl-1-2-naphthoquinone, as well as saccharose, gelatine and AlCl3-polymers of naphthalene. These residues, of an asphaltene type, exhibit similar infrared spectra, and are known to release hydrogen. This hydrogen, reacting with lean coals (lignites) is believed to hydrogenate them sufficiently to yield a coherent coke. O. P. Brysch

Gas Manufacture

Cottrell, A. F. and Austen, T. W. A REVIEW OF TOWN GAS PRODUCTION. *Gas World* (British), 89, 305-310 (1954) January 30.

A review of present day methods of town gas production and a comparison with former practise. The review contains material and energy balances for the contemporary methods of production. G. V. Vosseller

Gas Purification

Radford, D. E. THE PURIFICATION OF COAL GAS. *Nat. Gas Bull.* (Australia) 17, 25-28 (1953) November-December.

Practicality and economy in coal gas purification of small and large gas-works is discussed, with stress on the technical aspect rather than the theoretical. Problems and difficulties are

treated as encountered in the process of purification itself, (as oxide contamination and moisture content) in the apparatus in use, (Livesey washers, electrostatic precipitators) and of the extraneous consequences of weather and locality. A. J. Tulis

Williams, T. H. THE DESULPHURISATION OF COKE-OVEN GAS. *Coke and Gas* (British), 16, 61-67 (1954) February.

The plant installed recently at the Corby Coke ovens of Stewarts and Lloyds Limited for the desulfurization of coke-oven gas and the recovery of the hydrogen sulfide for the production of sulfuric acid is described. The Collin ammonia process, in which H_2S is selectively absorbed by ammonia water in the presence of CO_2 by controlling the time of contact, is combined with the *Chemiebau* wet-contact sulfuric acid process in which H_2S is burned to SO_2, and the resulting wet gas is treated catalytically for oxidation of SO_2 to SO_3. D. M. Mason

Producer Gas

Morris-Ashton, K. PERFORMANCE OF A "HOT GAS" MECHANICAL PRODUCER. *Gas World* (British), 89, 251-254 (1954) January 23; *Gas Times* (British) 78, 166-68, 173 (1954) February 5.

Review of "Hot Gas" mechanical producers of the central arch type includes economic and material balances of actual operations on a new installation of 2 benches, each of 24 West's horizontal retorts. G. V. Vosseller

5. NATURAL GAS AND NATURAL GAS CONDENSATES

Carbon Black

Lichtenfels, M. F. (assigned to Columbian Carbon Co.) PROCESS FOR RECOVERING CARBON BLACK FROM A GASEOUS SUSPENSION. U. S. 2,668,754 (1954) February 9.

An efficient process is claimed for removal of suspended carbon from the gases leaving a carbon black furnace. Two new ideas are incorporated in the overall design: 1) using a slurry of carbon black and water to cool the gases which allows the recycled carbon black in the slurry to be recovered in the collector system in the proper form, and 2) mechanically agitating with water, by means of a paddle-type fan, the gas leaving the collector system prior to the final scrubbing of the gas. By this procedure, residual carbon in the effluent gas has been reduced to as low as 0.04 grain of carbon black per cu.ft. of gas, measured at stack conditions (160-180° F.) H. C. Owen

Compressors

Mast, B. T. A COMPARISON OF DESIGN AND PERFORMANCE OF MODERN COMPRESSOR EQUIPMENT. *Gas*, 30, 108, 111 (1954) February.

The many recent improvements in reciprocating engines and new types of prime movers lately introduced into the natural gas transmission industry are discussed. Curves are presented showing brake horsepower and fuel requirements for each type of prime mover presently used, both for the best present design of each type as well as for conditions prevalent in the last few years. It is shown that the brake horsepower and fuel requirements for reciprocating engines are less than for all other types of present prime movers. H. C. Owen

New, W. R., Redding, A. H., Baldin, H. B. and Fentress, K. O. BASIC COMPRESSOR CHARACTERISTICS FROM TESTS OF A TWO-STAGE AXIAL-FLOW MACHINE. Amer. Soc. Mech. Eng., Paper No. 53—A-205 (1953) November-December.

Authors report tests at Westinghouse Electric Corp. Laboratories to determine pressure ratio and efficiency of a two-stage axial test compressor in the subsonic range. Parameters were a Reynolds number based on mean chord length of blading and an average relative velocity, and a Mach number based on average axial velocity relative to blade tip speeds. Blading was of vortex design with no tangential component entering the rotating blades, and with blade cross-section defined by an arc of a circle and a straight line, with leading edge rounded. The results as developed in three dimensional diagrams are believed generally to be representative of the behavior of axial compressor stages at subsonic velocities, even though absolute values of loading and efficiency are not indicative of the best current design standards.

P. R. Trumpler

Dessicant Gels

Hubard, S. S. EQUILIBRIUM DATA FOR SILICA GEL AND WATER VAPOR. *Ind. Eng. Chem.*, 46, 356-358 (1954) February.

Data of commercial usefulness on dessicant-grade silica gel are collected and presented graphically for temperatures from 40 to 200° F., for partial pressures of water vapor up to 16 in. mercury, and for adsorbed water contents up to 35 percent. Two graphs show the relationships of the three variables. Useful capacities are given, rather than total water contents. This obviates the necessity of allowing for the loss on ignition of activated silica gel as shipped. The data are applicable to often used grades, such as 3-8, 6-12, 6-16 and 14-20 mesh.

E. B. Shultz

Gas by Barge

Nelson, W. L. NATURAL GAS TO MOVE BY BARGE. *Oil Gas J.*, 52, 104, 105 (1954) March 22.

Transportation of natural gas by barge from Louisiana gas fields up the Mississippi and Illinois rivers to the Union stockyards in Chicago is scheduled for initial operation within the next few months. Each barge unit is 264 ft. long with a beam of 54 ft. and will carry five tanks, each tank being heavily insulated on the inside with balsa wood to carry 7,000 bbl. or more of liquid natural gas at atmospheric pressure and approximately —258° F. These barges are to operate on an 11 to 14 day round-trip cycle in two-barge tows, with vented gas being used normally as fuel for the towboat, while two are being filled with liquefied gas at the Gulf Coast, two others will be discharging 18 MMCF of gas per day at Chicago. Two and perhaps four other barges will be en route on the rivers. A special plant barge carrying the liquefaction equipment will be located at the source of the natural gas. At Chicago special facilities will be used to utilize the refrigeration available. A ton of refrigeration (288,000 Btu) is available from each 20-22 MCF of gas, and its value will be at least 5 cents per MCF. Many safety features are included in this system, including purging the tanks with carbon dioxide in the event all the liquid has evaporated, venting the gas in emergencies, and double-hull construction. Initial construction costs are high but are estimated to be less than half for barge movement than for pipeline transportation; also market areas and supplies of gas are not limited as with pipeline transportation.

H. C. Owen

Gas Story

Conover, A. W. NATURAL GAS: PAST, PRESENT AND FUTURE. *Gas Age*, 113, 38-41, 62-64 (1954) March 25.

This article presents first a general history of the large expansion of the natural gas business from 1943 to 1953 and predicts the number of customers and sales through 1956. The author presents six problems faced by the industry today: 1) meeting the public demand, 2) solving the peak-day problem; 3) meeting competition, especially from electricity; 4) developing better sales techniques; 5) attracting and developing better people for management; 6) problem of regulating agencies. He also lists eight bases for his optimism concerning the future of the natural gas business: 1) good reserves; 2) ability to transport gas from fields to markets; 3) favorable prices at market areas; 4) possibility of producing peak-shaving gas economically; 5) possibility of financing future expansion; 6) good management; 7) better regulatory atmosphere; and 8) strong national association.

H. C. Owen

Springborn, H. W. THE FIVE MIRACLES OF NATURAL GAS. *Gas Age*, 113, 41-48 (1954) February 25.

Natural gas delivered to the customer represents five distinct "miracles": Formation of the gas, production, transmission, storage and standby, and utilization. The advances of the industry are presented in these five areas, which together result in having gas available where it is needed when it is needed.

B. E. Eakin

High Pressure Supply

Emmony, R. D. APPROACH TO THE DESIGN OF HIGH PRESSURE BULK SUPPLY SCHEMES—I. *Gas World* (British) 89, 504-508 (1954) February 20.

This paper presents first a general discussion of the problem of designing a high-pressure bulk supply main, 14 miles long, linking an area

to be served with a major gas manufacturing station. Gas requirements for the area are first determined for the initial stage (first year of operation), the ultimate stage (at the end of the expected life of the projected system), and an intermediate stage (approximately halfway between the two other stages). Detailed calculations are then presented as to capital and annual operating costs for the three stages, using three sizes of pipe, two types of compressors, and necessary supplementary equipment, such as the holder used at the end of the line through which the area would be supplied and by which the load factor on the line would be maintained at as high a figure as possible. H. C. Owen

Emmony, R. D. APPROACH TO THE DESIGN OF HIGH PRESSURE BULK SUPPLY SCHEMES—II. *Gas World* (British) 594-598 (1954) February 27.

This paper first summarizes the various relevant annual operating costs for the intermediate stage as the criterion of the best design of the system since practise in this stage shows the proper balance of unit pumping costs and overall unit operating costs. Other factors entering into the design, such as cathodic protection and central point control, are discussed; but other important factors entering into the design, such as gas storage requirements or the possibility of gas production at the area to be served, are not. However, the general outline of the procedure for designing an integrated gas system and obtaining most economical results should be of benefit to those faced with similar problems. H. C. Owen

Jet Compression

Fletcher, G. R. GAS JET COMPRESSORS. *Petroleum Refiner*, 33, 107-111 (1954) February.

This article presents a general review of the application of gas jet compressors to compress a low-pressure gas using the energy available from a gas at a higher pressure, the final mixture of the two streams being at some intermediate pressure. Examples of such applications are given as well as some advantages, such as low installation and operating costs. The overall efficiency of the jet compressor is low, being usually of the order of 20%, and decreases as the compression ratio increases so that it finds its chief application at compression ratios less than three; however, where sufficient high-pressure gas is available, higher compression ratios can be obtained. It is pointed out that heating is often necessary at the compressor to prevent the build-up of ice since the expansion of the high-pressure gas occurs almost isentropically. Curves are also presented to give an approximate idea of how much high-pressure gas is necessary for compression under varying conditions. H. C. Owen

Liquefaction Storage

Ormston, R. H. LIQUEFACTION: THE ANSWER TO STORAGE? *Gas Age*, 113, 27-33 (1954) February 25.

A concise discussion of the commercial aspects in the liquefaction of natural gas for storage purposes is presented. The preliminary and pilot operations preceding, and the first commercial plant installed in Cleveland are described. The author also introduces recent metallurgical advancements which may present solutions to the chief problems of the liquefaction process; namely structural strength of vessels. J. M. Reid

Meter Testing

Mason, A. E. METHODS FOR THE DETERMINATION OF THE ACCURACY OF GAS METERING. *Gas World* (British), 89, 446-450 (1954) February 13; *Gas Times* (British) 78, 153, 154, 156, 161-63 (1954) Feb. 5; *Gas J.* (British) 277, 416-18 (1954) Feb. 17.

Since nationalisation of the gas industry, the testing of customer residential meters has been transferred to the Ministry of Fuel and Power. The specific methods for testing various types of gas meters that are utilized by the Birmingham Division Repair Shop are presented in some detail. The types of meters tested include wet and dry meters, rotary and diaphragm types, and Connersville meters. The calculations of errors are outlined for each illustration. B. E. Eakin

New Lines 1954

Taylor, D. M. U. S. PIPE LINES . . . 16,200 MILES OF NEW LINES TO BE BUILT IN 1954. CONSTRUCTION LESSENS. *World Oil* 138, 199, 200, 202-205 (1954) February 15.

Based on information from industry and government sources, "World Oil" predicts that 16,200 miles of new lines will be laid in 1954. This figure includes lines four inches and larger in diameter laid for crude, products, and natural gas outside corporate city limits and compares with 17,980 miles laid in 1953. In last year's expansion an important fact is noted that more miles of 30-inch pipe was laid than any other size; Lakehead Pipe Line Co. laid 643 miles of the almost 3,000 miles of 30-inch and gas companies the rest. It is estimated that 8,700 miles of new natural gas pipe lines will be constructed in 1954, 6,700 miles of main lines and 2,000 miles of gathering system lines. In 1953 the gas industry constructed a total of 9,890 miles of pipelines: 6,930 miles were main lines and 2,960 miles were field gathering lines. It is also estimated that in 1954 3,700 miles of crude lines and 3,800 miles of product lines will be constructed as compared to 4,650 miles and 3,440 miles, respectively, in 1953. H. C. Owen

Pipeline Testing

Powell, J. C. and Senatoroff, N. K. HYDROSTATIC TESTING: ECONOMIES, PROBLEMS AND PROCEDURES. *Gas*, 30, 96, 100, 102-104, 106-110 (1954) January.

A general background of hydrostatic testing and many suggestions as to properly designing and testing a pipeline for minimum test cost, minimum time required for testing, and minimum problems due to formation of gas hydrates following hydrostatic testing are presented.
H. C. Owen

Pressure Control

Kroeger, C. V. DESIGN AND OPERATION OF A SIMPLE PRESSURE ALARM SYSTEM. *Amer. Gas J.*, 180, 14, 15, 43 (1954) February.

A fully automatic pressure alarm system is described, which features variable limits to meet changing operating requirements, provides both visual and audio alarm, and is quite trouble free. This simple system operates whenever the transmission pressure passes high or low limits, when the high pressure system exceeds the high or low limits (and same for the intermediate pressure system), when electric power fails in the plant or, if there is a break in the interconnecting leased telephone cable. The system described is a fail-safe system, since any power interruption immediately energizes the alarm and the emergency station. B. E. Eakin

Production Future

Baker, H. H. NATURAL GAS FOR THE FUTURE. *Petroleum Eng.*, 26, E2-5, 8, 13, 14 (1954) February.

A discussion of the future of natural gas from a producer's point of view. The significance of Federal Power Commission activities, the nature of the producing company as compared to a utility and the importance of the risk element are stressed. R. F. Bukacek

Terry, L. F. SUPPLY WILL EXCEED 500 TRILLION CU. FT. (Natl. Fdtn. Financial Analysts Societies, Jan. 28, 1954) *Gas Age*, 113 38-40 (1954) February 25; *Gas*, 30, 144, 146 (1954) March.

This paper first presents a general discussion of reserves of natural gas in the United States. The author states that as long as more reserves are added each year than consumed, the trend of the ratio of proved reserves to annual production should not cause concern (23.2 as of Dec. 31, 1952, and 32.5 as of Dec. 31, 1946). From the standpoint of geological potentialities, the author states that the total future recoverable gas supply will exceed 500 trillion cubic feet. He also believes that production will grow to 12 to 14 trillion cubic feet annually by 1960. The paper then discusses in a general way the following topics: 1) development of gas fields; 2) improvement of transmission systems; 3) expanding markets; 4) The Phillips Petroleum case before the Supreme Court; and 5) field price of gas. The paper concludes with an enumeration of several factors to be considered concerning the increase in production in the future. H. C. Owen

Well Practise

Harden, C. M. and Morris, J. I. A STUDY IN SAFETY. *Petroleum Eng.*, **26**, B64, 67-72 (1954) February.

A discussion of a variety of safety measures undertaken at a well site where hydrogen sulphide was present in the well stream and severe hydrate formation was encountered. The many problems resulting from these two conditions make the solutions presented of considerable interest. R. F. Bukacek

Kastrop, J. E. DOWN-HOLE FREEZING STOPPED AT WORLAND. *World Oil*, **138**, 143-145, 152 (1954) February 1.

Methyl alcohol injection thru two macaroni strings lowered the dew point of gas-condensate produced from dually-completed wells, and prevented hydrate formation at the surface and in the production lines. The gas-condensate wells are used to operate the field's gas-lift system. No freezing has been experienced since the installation was completed. B. E. Eakin

6. PETROLEUM AND SYNTHETIC LIQUID FUELS

Aromatic Production

Jackson, W. K., Chadd, C. K. and Krausse, D. M. THE ECONOMICS OF MAKING HIGH PURITY AROMATICS. *Petroleum Processing*, **9**, 233-237 (1954) February.

The economics of the "Wax" Solvent extraction process to produce reagent grade aromatics are reviewed. Typical product analysis are presented along with cost data. G. V. Vosseller

Resen, F. L. B.T.X. CONVERSION PAYS OFF. *Oil Gas J.*, **52**, 127, 128, 131 (1954) February 8.

A small specialty refinery converted surplus equipment to removal of benzene, toluene and xylenes from a crude aromatic charge stock. Acid treatment and caustic neutralization is followed by fractionation. Two conventional 50-tray towers, operated either in series or in parallel, are used to recover benzene and toluene, and a 25-tray tower recovers a xylene mixture. E. B. Shultz

CO_2 Hydrogenation

Stowe, R. A. and Russell, W. W. COBALT, IRON AND SOME OF THEIR ALLOYS AS CATALYSTS FOR THE HYDROGENATION OF CARBON DIOXIDE. *J. Amer. Chem. Soc.*, **76**, 319-323 (1954) February.

The activity of cobalt, iron and some of their alloys as catalysts for the hydrogenation of the oxides of carbon has been measured. These catalysts were prepared by the reduction of the precipitated or coprecipitated metal carbonates and/or hydroxides. X-ray examination of these catalysts indicates that they possess the lattice constants of recorded equilibrium alloys. No simple relationship is found between the activity of the catalysts and their metallic composition. A tentative explanation of catalyst activity appears possible in terms of lattice parameter and atomic moment. Authors' Abstract

Fischer-Tropsch

Gibson, E. J. and Hall, C. C. THE FISCHER-TROPSCH SYNTHESIS WITH COBALT CATALYSTS: THE EFFECT OF PROCESS CONDITIONS ON THE COMPOSITION OF THE REACTION PRODUCTS. *J. Appl. Chem.* **4**, 49-61 (1954) February.

The effects of the process variables on the alcohol and olefin contents of the liquid products and on the molecular weight of the total product obtained by synthesis with cobalt catalysts have been investigated. The results suggest that the composition of the product is determined partly by the direct influence of the catalyst, the temperature, pressure, mean ratio of hydrogen to carbon monoxide, and space velocity of fresh gas, and partly by an indirect effect of these variables exerted through the extent of conversion of carbon monoxide and hydrogen. There is evidence that suggests that the olefin content varies inversely with the average molecular weight of the product. Authors' Abstract

Hemminger, C. E. (assigned to Standard Oil Development Co.) REGENERATION OF IRON HYDROCARBON SYNTHESIS CATALYST. U. S. 2,670,364 (1954) February 23.

A process for the dewaxing of iron type synthesis catalysts in fluidized beds while operating. G. V. Vosseller

Watts, R. N. and Gray, C. F. (assigned to Standard Oil Development Co.) HYDROCARBON SYNTHESIS PROCESS. U. S. 2,670,365 (1954) February 23.

This invention relates to the catalytic conversion of carbon oxides with hydrogen to form valuable synthesis products. More particularly it is concerned with an improved method and catalyst permitting a high degree of flexibility in carrying out this synthesis using the fluid solids technique, at the same time retarding or preventing catalyst disintegration and obtaining exceptionally high yields of valuable liquid products. S. Volchko

Petroleum Sulfur

Girelli, A. PREMESSA ALLO STUDIO DELLE RELAZIONI PROPRIETA — STRUCTURA TRA COMPOSTI SOLFORATI DEL PETROLIO. (STUDIES OF PROPERTIES-STRUCTURE RELATIONSHIPS OF THE SULFUR COMPOUNDS OF PETROLEUM) *Rivista Dei Combustibili* (Italian) 8, 15-24 (1954) January.

Correlations between chemical structure and physical properties for different series of petroleum sulphur compounds have been studied. Boiling and freezing point, density, viscosity, refraction index, specific refraction and refractivity intercept have been plotted against number of carbon atoms of different series of sulphur compounds. More data, and more accurate, on physical properties of such compounds, will allow a more complete and satisfactory approach to the establishing of chemical structure physical properties relationships.

Author's Abstract

Shale Processing

Jensen, H. B., Barnet, W. I., and Murphy, W. I. THERMAL SOLUTION AND HYDROGENATION OF GREEN RIVER OIL SHALE. U. S. Bureau Mines Bull. 533 (1953).

A method of shale oil production which appears to convert a higher percentage of the organic matter in oil shale to volatile products consists of heating the shale in the presence of a solvent, and extracting the soluble conversion products. This was investigated with solvents such as petroleum kerosine in a batch autoclave at temperatures from 700 to 900° F. Maximum conversions of 90% were noted. A semi-continuous, and then a continuous unit were built to operate at temperatures up to 850° F. under pressures up to 500 psi. Somewhat higher conversions were found. Batch thermal solution with concurrent hydrogenation was also studied in the expectation that polymerization of the solvent oil could be prevented. With high hydrogen partial pressure, yields equivalent to 126 weight percent of Fischer assay were obtained. Unfavorable features, such as the high boiling range of product and difficulty of separating oil from spent shale, are discussed. E. B. Shultz

Rubel, A. C. LIQUID FUELS FROM OIL SHALE—A CRITICAL REVIEW. *J. Petroleum Techn.*, 6, 9-11, 13, 15, 16, 19 (1954) February.

One of the greatest concentrations of potential energy in the world is the oil shale deposits of Northwestern Colorado which could produce billions of barrels of high quality liquid fuels, as well as gaseous fuels, ammonia, sulfur, coke and petrochemicals. The author develops the thesis that we face an increasing dependence upon foreign crude supplies, and that development of domestic oil shale deposits is prudent and sensible, especially in the event of another national emergency. The current reawakening of interest in shale oil by major oil and chemical companies is cited, and present knowledge of mining, retorting and refining is collected and interpreted economically. It is concluded that shale exploitation is sufficiently feasible so that immediate development is justified. The author suggests that private industry (oil or chemical) undertake the work in cooperation with the Defense Department. Industry would build and operate on a cost basis without profit in order to develop the technology. For the present, Government would underwrite any losses in the interest of national security. E. B. Shultz

Waste Treatment

Ruchhoft, C. C., Middleton, F. M., Braus, H. and Rosen, A. A. TASTE- AND ODOR-PRODUCING COMPONENTS IN REFINERY

GRAVITY OIL SEPARATOR EFFLUENTS. *Ind. Eng. Chem.*, **46**, 284-289 (1954) February.

Organic materials in the effluents were concentrated by adsorption on active carbon and by liquid-liquid extraction. Examination of the recovered extracts indicated the neutral materials, largely aliphatic and aromatic hydrocarbons and cyclic sulfur compounds, to be the principal source of odorous components in these wastes. Authors' Abstract

7. ANALYTICAL METHODS AND TESTS

Aromatics Determination

Pasquinelli, E. A. RAPID DETERMINATION OF AROMATICS IN PETROLEUM FRACTIONS ABSORPTION WITH PICRIC ACID-NITROBENZENE. *Anal. Chem.*, **26**, 329-342 (1954) February.

A simple, rapid method for determining aromatics in petroleum fractions boiling below 600° F. wherein a 10 ml sample is sufficient for a pair of determinations. It is precise to ± 0.5% and accurate to approximately ± 1.0%. The method is simple and involves a minimum of equipment. P. V. Burket

CO Determination

Mertens, H. UEBER DIE EIGNUNG VERSCHIEDENER KUPFER-I-CHLORIDLOESUNGEN ZUR KOHLENOXYDABSORPTION BEI DER ORSATANALYSE. (THE SUITABILITY OF DIFFERENT CUPROUS CHLORIDE SOLUTIONS FOR ABSORPTION OF CO IN ORSAT ANALYSIS). *Gas- und Wasserfach* (German), **95**, 79-83 (1954) February 1.

Ammoniacal, neutral, and hydrochloric acid solutions of cuprous chloride were compared with respect to rapidity of absorption, partial pressure of CO after absorption, and total capacity. Ammoniacal solution (according to Hempel or Ott) was concluded to be best suited for Orsat apparatus because of its lower partial pressure of CO, greater capacity, and slightly greater speed of absorption. Partial pressure of ammonia over the Hempel ammoniacal solution was 1.5 mm Hg at 25° C., and over the Ott solution 0.7 mm. Partial pressure of HC1 over the HC1 solution (according to Winkler) was 0.26 mm. Hg. Ammonia vapor from ammoniacal solutions need not be absorbed by passing the gas through an acid solution if an acidified aqueous confining solution is used.

D. M. Mason

Hydrocarbons in Air

Quiram, E. R., Metro, S. J. and Lewis, J. B. DETERMINATION OF HYDROCARBON GASES AS AIR CONTAMINANTS. *Anal. Chem.*, **26**, 352-354 (1954) February.

A method has been developed for the determination of gaseous hydrocarbons in the atmosphere in concentrations of less than 1%. The gases were concentrated by adsorption on silica gel at −100° F., desorbed into an evacuated stainless steel container, and analyzed by a mass spectrometer. Approximately 95% recovery of C_3, C_4, and C_5 hydrocarbons was obtained, while the recovery of ethane was 60%. Low concentrations of hydrocarbons (3 to 8 p.p.m.) were detected when analyzing air near a refinery.

C. E. Hummel

Mercaptans

Hopkins, R. L. and Smith, H. M. EXTRACTION AND RECOVERY OF THIOLS FROM PETROLEUM DISTILLATES. *Anal. Chem.*, **26**, 206-207 (1954) January.

The study of sulfur compounds in crude oils requires methods for separating the various types of sulfur compounds quantitatively from petroleum distillates. This report describes the qualitative testing and quantitative application of a method for thiols (mercaptan) using sodium aminoethoxide in ethylenediamine solution. This method has been successfully used in the separation of thiols from a distillate boiling between 111° and 150°C.

Authors' Abstract

Minor Gas Components

Shepherd, M. APPARATUS FOR THE DETERMINATION OF MINOR COMPONENTS OF A GAS MIXTURE. *J. Res. Nat. Bur. Stand.*, **52**, 1-6 (1954) January.

The apparatus is primarily for the determination of the components occurring in low partial pressures in a gas mixture, and which or-

dinarily cannot be determined with satisfactory accuracy because of the significant sorption and desorption of major components in the reagents intended for the removal of the minor ones. Small amounts of solid and liquid reagents are used in the apparatus, and combustions, as well as absorptions, can be performed. The apparatus can be made a separate unit or part of a standard apparatus for volumetric chemical gas analysis. Author's Abstract

Olefin Reagent

MacPhee, R. D. USE OF MOLYBDATES FOR ESTIMATING AMOUNT OF OLEFINIC TYPE HYDROCARBONS IN AIR. *Anal. Chem.*, **26**, 221-225 (1954) January.

A reagent was developed which permitted estimation of micro quantities of olefinic hydrocarbons in air within a factor of about two.
C. E. Hummel

Petroleum Chromatography

Karr, C., Jr., Weatherford, W. D., Jr. and Capell, R. G. CHROMATOGRAPHIC FRACTIONATION OF CRUDE PETROLEUM OILS. *Anal. Chem.*, **26**, 252-256 (1954) February.

The application of the technique of elution chromatography to the fractionation of undiluted virgin crude oils has been investigated, and typical data are presented demonstrating the type and extent of fractionation obtained using alumina and bauxite adsorbents. An apparatus was developed to facilitate the fractionation of virgin crude oils by elution chromatography. The alumina and bauxite adsorbents have been found satisfactory for separating hydrocarbon components from high-sulfur crude oils in a colorless, sulfur-free, metal-free, fractionated state, while yielding sulfur compound concentrates and asphaltic fractions. Certain hydrocarbon classes, such as paraffins and mononuclear aromatics, may be recovered directly uncontaminated by other hydrocarbon classes by proper selection of cut points.
Authors' Abstract

Phenol Determination

Schmauch, L. J. and Grubb, H. M. DETERMINATION OF PHENOLS IN WASTE WATERS BY ULTRAVIOLET ABSORPTION. *Anal. Chem.*, **26**, 308-311 (1954) February.

A spectrophotometric method capable of detecting as low as 10 parts per billion of phenols in water is described. D. V. Kniebes

Sampling

Gibson, W. E. THE AUTOMATIC SAMPLING OF HYDROCARBONS IN DIRECT PROPORTION TO THE FLOW. Amer. Soc. Mech. Eng. Paper No. 53—A148 (1954) January 11.

(See Gas Abs. **10**, 71 (1954) April)

Sulfur Method

Bethge, P. O. ON THE VOLUMETRIC DETERMINATION OF HYDROGEN SULFIDE AND SOLUBLE SULFIDES. *Anal. Chimica Acta* **10**, 113-116 (1954) February.

Two procedures for the determination of sulfides are compared. In one, the sulfide, contained in a weakly alkaline cadmium acetate solution, is added to a neutral solution containing potassium iodide and potassium iodate, which is then acidified. It is shown that, when this order is followed, errors are introduced, which are probably due to the partial oxidation of sulfide to sulfate instead of to elemental sulfur. In the other method the sulfide in the cadmium acetate solution is added first to an acid solution, followed by the addition of the potassium iodide-iodate solution. The theoretical yield was obtained. Author's Abstract

Halvorson, G. H., Lutz, E. H. and Swensen, J. F. METHOD FOR DETERMINING SULFUR CONTENTS BY COMBUSTION. U. S. 2,669,504 (1954) February 16.

A method and apparatus are described for determining sulfur in metals and other materials by burning in oxygen and simultaneously titrating iodometrically the evolved SO_2. More accurate determinations requiring less time and attention than have been possible heretofore are claimed. D. J. Dennison

Sulfur X-Rays

Cranston, R. W., Mathews, F. W. and Evans, N. THE SUNBURY X-RAY ABSORPTION METHOD FOR THE RAPID DETERMINA-

TION OF SULFUR IN HYDROCARBONS. *J. Inst. Petroleum* (British) 40, 55-63 (1954) February.

This paper presents a method for the determination of sulfur by means of X-ray absorption. The method has been developed to meet the need in the control of refinery processes for a rapid and, at the same time, a reasonably accurate method for the determination of sulfur in petroleum and its products. The average time required for a single determination on a distillate sample is about 5 minutes and for residual samples 5 to 15 minutes, depending on the viscosity and hence the time required to fill the cell. The accuracy is of the order of ± 0.03 per cent sulfur for distillates and ± 0.1 per cent sulfur for crude oils and residual fuels. Details are given of the principle of the method, the equipment required, and the procedures for calibration and operation of the instrument. Experimental results are given which show the repeatability of the method, its absolute accuracy, and a comparison between such results and those obtained by conventional methods. Authors' Abstract

8. GENERAL AND PHYSICAL CHEMISTRY

Acetylene-Air

Smith, R. W., Jr., Manton, J. and Brinkley, S. R., Jr. THE THERMODYNAMICS OF COMBUSTION GASES: TEMPERATURES OF ACETYLENE-AIR FLAMES. U. S. Bur. Mines Rep. of Invest. 5035 (1954) February.

Tables are presented for thermodynamic properties of acetylene-air mixtures at various pressures and temperatures. E. F. Searight

Absorption

Dixon, B. E. and Swallow, J. E. USE OF LIQUID FILMS IN THE STUDY OF THE ABSORPTION OF GASES BY DROPS. *J. Appl. Chem.*, (British) 4, 86-93 (1954) February.

In a continued study of the absorption of gases by liquid drops, search has been made for physical barrier capable of separating two gas phases while permitting the passage of drops. For this purpose a draught of inert gas and a mass of foam were only partially successful, but a liquid film stretched across the absorption chamber was found to provide a satisfactory gas-barrier with a life of several hours. The passage of drops through the film was observed by means of high-speed cinematography. Results obtained by means of film barriers for the absorption of carbon dioxide by water drops during formation have been compared with those previously obtained by another method. The desorption of carbon dioxide by water drops in air has been measured, and the application to the process of desorption of an expression previously derived for the absorption coefficient is considered. Authors' Abstract

Adsorption

Granquist, W. T., Mitch, F. A. and Edwards, C. H. ADSORPTION OF NORMAL SATURATED HYDROCARBONS ON FULLER'S EARTH. *Ind. Eng. Chem.*, 46, 358-362 (1954) February.

Adsorption of N_2, CH_4, C_2H_6, C_3H_8, and n-C_4H_{10} on Florida-Georgia fuller's earth is studied by the BET technique and results are compared with previous work. S. Hu

Ammonia Synthesis

Dunwoody, W. B. HIGH PRESSURE SYNTHESIS. *Instrumentation*, 7 No. 2, 27-31 (1954).

Mississippi Chemical Corporation's ammonia plant at Yazoo, Miss. uses a highly efficient version of the Claude process, plus modern instrumentation, for high pressure synthesis of ammonia from natural gas. The ammonia is utilized in the manufacture of low-cost nitrogenous fertilizers. The plant differs from conventional ammonia plants in that there is no intermediate storage or surge capacity in the way of a gas holder. Also, all compression is carried out after purification except for final CO removal at the methanator which enables compressing the gas to 15,000 psi. in only 6 stages. The plant utilizes the newest advances in instrumentation. B. E. Eakin

Reidel, J. C. UNIQUE AMMONIA PLANT OPENED. *Oil Gas J.*, 52, 60-62 (1954) February 8; *Chem. Eng.*, 61, 126 (1954) April.

Spencer Chemical's new ammonia plant in Vicksburg, Miss. is discussed. The operation

including the initial partial oxidation of natural gas, is described with the aid of a flow diagram.
W. J. Pleticka

Calorimetry

Hubbard, W. N., Katz, C. and Waddington, G. A ROTATING COMBUSTION BOMB FOR PRECISION CALORIMETRY. HEATS OF COMBUSTION OF SOME SULFUR-CONTAINING COMPOUNDS. *J. Phys. Chem.*, **58**, 142-152 (1954) February.

To obtain accurate heat of formation data for organic sulfur compounds, a heat of combustion calorimeter has been developed in which it is possible to rotate the bomb after the combustion. Rotation of the bomb tends to produce a thermo-dynamically defined final state for the combustion process, because the stirring action hastens the attainment of (a) homogeneity of the bomb solution and (b) equilibrium with respect to solution of the bomb gases in the solution. The indications are that the rotating bomb will have many other applications in combustion calorimetry, particularly in cases in which it is advisable to add a large amount of liquid to the bomb. Standard heats of formation of 1-pentanethiol, 3-thiapentane, 2-methyl-2-propanethiol, thiacyclopentane, and thianthrene are given. D. M. Mason

Hubbard, W. N., Scott, D. W. and Waddington, G. REDUCTION TO STANDARD STATES (AT 25°) OF BOMB CALORIMETRIC DATA FOR COMPOUNDS OF CARBON, HYDROGEN, OXYGEN AND SULFUR. *J. Phys. Chem.*, 58, 152-162 (1954) February.

The Washburn corrections, i.e., corrections for the reduction of bomb calorimetric data to standard states, are extended to apply to compounds that contain sulfur in addition to carbon, hydrogen and oxygen.
Authors' Abstract

CS_2 Synthesis

Folkins, H. O. and Miller, E. (assigned to Food Machinery and Chemical Corp.) PROCESS FOR THE PRODUCTION OF CARBON DISULFIDE. U. S. 2,668,752 (1954) February 9.

High yields of CS_2 can be obtained by reacting hydrocarbon gases rich in methane with sulfur in the presence of zirconium oxide gel alone and supported on silica gel or on activated carbon. The reaction proceeds at a temperature in the range from about 400° to 700°C. and at absolute pressures up to several atmospheres.
D. M. Mason

Compressibility

Corrigan, T. E. and Johnson, A. F. CHEMICAL ENGINEERING FUNDAMENTALS—COMPRESSION AND EXPANSION—III. *Chem. Eng.*, **61**, 212, 214, 216, 218, 220 (1954) February.

This article deals with the problems of centrifugal compression. Heat concept is classified and the method for obtaining polytropic flow work is demonstrated. D. C. Gami

Watson, G. M., Stevens, A. B., Evans III, R. B. and Hodges, D., Jr. COMPRESSIBILITY FACTORS OF NITROGEN-PROPANE MIXTURES IN THE GAS PHASE. *Ind. Eng. Chem.*, **46**, 362-364 (1954) February.

Compressibility factors for propane-nitrogen mixtures are presented. Three mixtures for 259.08°F., and three for 300°F. All mixtures in the range from 30 to 85% propane, and pressures range to 600 psia. R. F. Bukacek

Kinetics

Carpenter, L. G. THE KINETICS OF THE CHEMICAL REACTION BETWEEN A SOLID AND A GAS STREAM MOVING OVER IT. Roy. Aircraft Estab. Techn. Note Met. 182 (British) (1953) October.

A simplified rate equation, based on the total chemical and diffusional resistance, is derived for reactions between gases and solids.
C. G. von Fredersdorff

Sulfur Compounds

Finke, H. L., Gross, M. E., Messerly, J. F. and Waddington, G. BENZOTHIOPHENE: HEAT CAPACITY, HEAT OF TRANSITION, HEAT OF FUSION AND ENTROPY. AN ORDER-DISORDER TRANSITION. *J. Amer. Chem. Soc.*, **76**, 854-857 (1954) February 5.

The heat capacity of benzothiophene was studied between 12° and 335° K. D. M. Mason

9. ORGANIC CHEMISTRY

Acetylene Process

Sachsse, H., Kosbahn, T. and Lehrer, E. (assigned to Badische Anilin- & Soda-Fabrik Aktiengesellschaft) PROCESS FOR THE PRODUCTION OF ACETYLENE BY INCOMPLETE COMBUSTION OF HYDROCARBONS. U. S. 2,664,450 (1953) December 29.

An improved oxygen-hydrocarbon mixing apparatus for production of acetylene by incomplete combustion (Sachsse process) is described. It is claimed that large quantities of preheated hydrocarbon gas and oxygen can be successfully premixed without danger of flashback from the combustion chamber. This problem has been solved on the pilot plant level but for commercial installations requiring significantly larger quantities of feed materials difficulties were encountered in obtaining efficient premixing without flashback. J. M. Reid

Alcohol Synthesis

Catterall, W. E. and Lane, S. C. (assigned to Standard Oil Development Co.) ALCOHOL SYNTHESIS. U. S. 2,669,589 (1954) February 16.

A process is claimed for the synthesis of primary butyl alcohol from propylene, carbon monoxide and hydrogen, using a suitable non-olefinic hydrocarbon to suppress undesirable interactions. W. J. Pleticka

Aldehyde from Methane

McKinnis, A. C. (assigned to Union Oil Co. of California) MANUFACTURE OF FORMALDEHYDE. U. S. 2,667,513 (1954) January 26.

One object of the invention is to provide a process whereby methane or natural gas is partially oxidized to formaldehyde by means of an oxidizing agent which can readily be regenerated for re-use in the process. A further object is to provide a process whereby methane or natural gas is oxidized to form formaldehyde in yields higher than those heretofore realized. $CH_4 + 2NO_2 = HCHO + 2NO + H_2O$. J. G. Chalcraft

Synthetic Phenol

NEW PLANT FOR SYNTHESIS OF PHENOL FIRST ON WEST COAST. *Petroleum Processing*, 9, 238-241 (1954) February.

A brief description of Monsanto Chemical Company's new synthetic phenol plant at Avon, California is given. The plant uses the sulfonation process. W. J. Pleticka

10. CHEMICAL ENGINEERING

Absorption

Emmert, R. E. and Pigford, R. L. A STUDY OF GAS ABSORPTION IN FALLING LIQUID FILMS. *Chem. Eng. Progress*, 50, 87-93 (1954) February.

Mathematical analyses of unsteady-state mass transfer in falling films are collected from the literature and tested with the absorption and desorption of O_2 and CO_2 in two wetted-wall columns. Wetting agent is used only in the longer column to prevent rippling in the film. Discrepancies between experimental results and theoretical prediction are explained in terms of an interfacial resistance. Transition from laminar to turbulent flow is found to occur at a Reynolds number of about 1,200. S. Hu

Fluid Flow

Weintraub, M. FLUID DYNAMICS. *Ind. Eng. Chem.*, 46, 112-115 (1954) January.

This review covers developments of the past year. Single phase flow, flow through porous media, multiphase flow, pumps, and viscosity are included. Numerous references are included with emphasis toward chemical engineering design rather than developments in basic fluid dynamics. W. W. Clauson

Fluidized Processes

King, A. S. and Cross, W. J., Jr. (assigned to Houdry Process Corporation) APPARATUS FOR CONTROLLING BED DEPTH IN CONVERSION SYSTEMS. U. S. 2,670,278 (1954) February 23.

A method of regulating bed depth in catalytic reactors of the fluid or moving-bed type is described. The regulation is accomplished by use of a differential pressure controller to actuate a diaphragm valve controlling the catalyst inlet flow to the reactor. W. G. Bair

Odell, W. W. PROCESS AND MEANS OF PROMOTING CHEMICAL REACTIONS. U. S. 2,662,091 (1954) December 8.

The inventor claims processes of promoting chemical reactions by passing a fluid stream upwardly through a mass of fluidized, finely divided solids,—in particular catalytic reactions of gases and vapors with each other or with another liquid. One object is to pass a gasiform stream initially containing at least one reactant component and a liquid upward through a mass of small-sized catalyst at favorable conditions. Other particular processes claimed are governed by composition of reactant material, constitution of liquid or gasiform stream, flow rate, level of suspension of reactants, particle size of catalyst and/or solid reactant, catalyst activity, temperature and pressure. A. J. Tulis

Weinrich, W. W. (assigned to Houdry Process Corp.) PROCESSES EMPLOYING FLUENT SOLID PARTICLES. U. S. 2,669,540 (1954) February 16.

A design is given for a fluidized catalytic reactor that continuously regenerates the catalyst after one pass through the reactor chamber. G. V. Vosseller

Heat Balance

Bottomley, H. HEAT AND MATERIAL BALANCE. *Petroleum Refiner*, 33, 159-161 (1954) January.

A condensed form of heat and material balance is presented, which will supply all the necessary data to size the equipment for a refinery processing unit. H. C. Owen

Heat Exchangers

Gilmour, C. H. SHORTCUT TO HEAT EXCHANGER DESIGN—V. *Chem. Eng.*, 61, 190-194 (1954) February.

The fifth article in this series deals with heat exchanger design when phase changes and subcooling occur. Nomenclature follows that of earlier articles. W. G. Bair

Norman, W. S. and Sawyer, C. H. (assigned to C. D. Patents Limited, London) METHOD OF MAKING A HEAT EXCHANGER. U. S. 2,670,311 (1954) February 23.

This invention embodies a method of making heat exchangers from moulded carbon plates. Details of manufacture are covered by 8 claims. S. Hu

Heat Recovery

Eardley, S. J. THE RECOVERY AND USE OF REJECTED (WASTE) HEAT IN INDUSTRY. *J. Inst. Fuel* (British) 27, 67-78 (1954) February.

The paper gives a review of the primary and secondary heat requirements of some 20 industrial processes, with particulars of the sources and forms of rejected (waste) heat from these processes. Examples are quoted of some processes where waste heat could be used with advantage to meet other heat requirements of the works. Schedules appended give further information and detailed calculations of a test on a boiler and generating set where condenser circulating water was used for process, resulting in high overall efficiency. Author's Abstract

Oxygen

Sherwood, P. W. TONNAGE OXYGEN. PART III. "PACKAGE" UNITS. *Petroleum Refiner*, 33, 117-122 (1954) February.

A discussion is presented of the major types of tonnage oxygen processes that are available as "package" units. These include the Linde-Frankl I and II, the Air Reduction Oxygen, the Kellogg, the Elliott and the British Rescol cycles. Flow diagrams for each are included along with a table comparing the different cycles. Cost data for three oxygen cycles for plant sizes of 50 to 500 tons per day are tabulated. E. J. Pyrcioch

Pipe System Design

Blick, R. G. PIPE FLEXIBILITY CALCULATIONS. *Petroleum Refiner*, 33, 123-130 (1954) February.

Flexibility calculations for pipe layouts are facilitated by reducing the procedure into simple arithmetic operations. These operations are summarized into tabular forms, called pipe

expansion-stress forms, so that numerical calculations can be carried out by simply following the instructions contained on the forms without referring to any formulas. Three sample solutions are given with the forms. Derivation of the method is also appended. S. Hu

Tower Packing

Foster, D. B. and Norman, W. S. (assigned to C. D. Patents Limited) APPARATUS FOR TREATING GASES WITH LIQUIDS. U. S. 2,665,123 (1954) January 5.

Ordinary packing materials used in scrubbing towers have many disadvantages: metallurgical coke and earthenware (ring) give irregular results and excessive pressure drop; metal grids are easily corroded; and wood grids are susceptible to decay. This patent claims a new type of grid packing made of carbonaceous material, which is said to be free from the disadvantages of the other types. S. Hu

WIRE MESH AIDS TOWER OPERATION. *Petroleum Processing*, **9**, 227-228 (1954) February.

An installation of type 304 stainless steel wire mesh section, about 4 in. thick, for entrainment control inside the asphalt vacuum tower at Sinclair Refining Co's. Sinclair, Wyo. refinery has been found to increase the tower capacity and improve the quality of the gas oil and the asphalt. Installation and maintenance are relatively inexpensive, replacement being necessary only when the pressure drop increases from 2 to 7 mm Hg due to carbon build-up in the mesh. Estimated life of the mesh under normal operating conditions is between 2 to 3 years. S. Hu

11. PROCESS EQUIPMENT AND INSTRUMENTATION

Camera

Findley, L. D., Kennedy, E. S. and Van Horn, J. H. MULTIEXPOSURE FLASH FOR HIGH-SPEED CAMERAS. *Electronics*, 27, 180-182 (1954) February.

The system utilizes a group of ten one-microsecond pulses synchronized with camera action. The equipment consists of a timing-pulse source and driver, a pulser with energy storage and power supply, a light source and a photographic recorder. A block diagram of the complete photographic system is shown.

J. G. Chalcraft

Computors

Thomas, B. W. INSTRUMENTATION. *Ind. Eng. Chem.*, **46**, 79A, 80, 82 (1954) February.

Full-scale electronic general-purpose digital computing equipment costs are such as to prevent their application to process control where only a few variables are to be considered. However, computor components are becoming available which will allow the construction of relatively inexpensive special purpose equipment capable of monitoring process variables and rapidly reducing the data to useable forms for personnel, or controlling the variables automatically. Increased use of the new NBS mechanical production line should result in substantial reduction in computor costs. Any organization contemplating purchase of a computor that does not have factory representative-maintenance should have at least one man trained by the factory to perform this function, as the efficiency of the entire computor program will be dependent on efficient maintenance of the machine. B. E. Eakin

Flow Meter

PRECESSION TO MASS FLOW RATES. *Chem. Eng.*, **61**, 270, 272, 274, 276, 278, 280, 282 (1954) February.

Control Engineering Corp. of Norwood, Mass. is investigating a new type of flow meter utilizing the gyroscopic principle and expects to offer it for sale during the second half of 1954. Movement of fluid flowing through a circular pipe corresponds to a gyro wheel rotating in the x-y plane about the z-axis. The whole ensemble is rotated with a synchronous motor in the y-z-plane about x-axis at a constant speed of 200 rpm. The precession torque, T, produced about the z-axis is converted by an electromagnetic transducer into electrical signals as strong as 30 V. which permits operation on remote locations without amplification. Production models will be built in sizes for flows ranging from 300-200,000 lbs. per hr. S. Hu

Instruments

Rimbach, R. THE INSTRUMENT INDUSTRY—TODAY AND TOMORROW. *Instruments and Automation*, 27, 114-118 (1954) January.

A report showing the past and present economic status of the instrument industry, with estimates of future expansion.

P. V. Burket

Smoke Meter

McCabe, L. C. ATMOSPHERIC POLLUTION. *Ind. Eng. Chem.*, 46, 95A, 96, 98 (1954) February.

A new commercial instrument for measuring smoke is described. The principles of the Nyder gun sight are applied to overcome difficulties experienced with the Ringelmann chart.

D. M. Mason

12. MATERIALS OF CONSTRUCTION

Cathodic Protection

Lewis, D. H. and Mudd, O. C. CATHODIC PROTECTION: ECONOMIC ASPECTS OF CORROSION CONTROL. *Chem. and Ind.* (British), No. 4, 93-98, 99, 100 (1954) January 23.

The economical and technical aspects of various preventive and remedial measures for abating pipeline corrosion are discussed in detail. Practical recommendations are supported by long-range field test data in both tabular and graphical form. S. Hu

Thomson, A. G. CATHODIC PROTECTION OF PIPELINES AND STORAGE TANKS. *Petroleum*, 17, 54, 55, 64 (1954) February.

This reviews current Russian practice and equipment as given in the British Department of Scientific and Industrial Research Translation of "Cathodic Protection of Pipelines and Storage Tanks", [H.M.S.O., 10s/0d ($2.25)], a Russian book by V. A. Pritula.

R. F. Bukacek

Whalley, W. C. CATHODIC PROTECTION. *Chem. and Ind.* (British) No. 6, 140-147 (1954) February 6.

The problem of highly corrosive soils on new and proposed pipelines in the Middle East is discussed. The applicability of cathodic protection to such lines is summarized, and various other methods of protection are discussed. This paper was presented as a Symposium on Cathodic Protection organized by the Society of Chemical Industry in London, November 13, 1953. B. E. Eakin

Coatings

Bobalek, E. G. THE USE OF ORGANIC PROTECTIVE COATINGS IN CONTROLLING CORROSION. *Corrosion*, 10, 73-81 (1954) February.

The principles applying to the formulation of organic coatings are given and the effects of vehicle, pigments, and thinners are discussed. Special problems applicable to the preparation and application of plastic coatings are discussed with particular reference to their adhesion, solubility, and pigment dispersion characteristics. Plastic prefabricated liners, liquid coatings, dispersion resins, hot melt techniques and mastics are covered. The mechanism by which coatings retard corrosion are listed and the relative value of barrier and polarizing coatings mentioned. Coatings suitable for severely corrosive environments are considered and the special qualities of coatings suitable for use underground are listed. The questions of adhesion, permeability, surface preparation and chemical stability are correlated for coatings suitable for underground pipe or marine vessels. Author's Abstract

Burns, F. B. PROTECTING THE PROTECTION ON BURIED PIPELINE. *Oil Gas J.*, 52, 128-130 (1954) February 15.

Methods of pipeline wrapping are reviewed, and material and cost estimates are made for protection of various size pipes.

G. V. Vosseller

Shideler, N. L. HOT COAL-TAR COATINGS APPROACH IDEAL. *Oil Gas J.*, 52, 159, 160, 162, 164 (1954) February 15.

These coal-tar coatings, which proved the nearest to possessing the ten characteristics desired in an ideal protective coating, are divided into three ranges for which the specifications are given and a discussion pertaining to various applications is presented. S. Volchko

Corrosion of Equipment

Armstrong, J. B. FIELD AND LABORATORY METHOD FOR INVESTIGATING CORROSION. *Gas*, 30, 99, 101, 102, 104 (1954) February.

Some methods are presented for evaluating a potential corrosion through visual and thickness-indicating instrument inspections. A commendable one is the "iron count". The iron concentrations, which give a direct measure of the rate at which the steel equipment is being corroded, is determined in the laboratory by a thiocyanate colorimetric test. The author treats mostly the corrosion problems in gasoline plants. S. Sensi

Corrosion Causes

Shock, D. A. WHERE DOES CORROSION STRIKE THE HARDEST? *Oil Gas J.*, 52, 122-126 (1954) February 15.

Corrosion due to pressure of oxygen, to acids produced from H_2S and CO_2, and to low-fatty acids in water phase, which depend upon production methods in various types of wells, is discussed. Severity of acid corrosion depends upon the partial pressure and CO_2 and the pH at well conditions. The low-pressure sweet oil corrosion constitutes one of the coming major corrosion problems to the producing oil industry. D. C. Gami

Gas Furnace Linings

Blaha, E. THE SELECTION OF REFRACTORY MATERIALS FOR GAS-FIRED EQUIPMENT. *Ind. Heating*, 21, 343, 344, 346, 348, 350, 352 (1954) February; *Amer. Gas J.*, 180, 16, 17, 41 (1954) February.

Some old and some newly developed refractory materials suitable for furnace linings in gas-fired equipment are reviewed. The composition, method of preparation and characteristics of such refractories as silica, mullite, and zircon are presented. Included is a discussion of refractories such as cordierite, carbides, magnesite and chrome ore materials for special applications. Although gas firing does not result in certain harmful effects on refractories of less refined fuels, the high speed heating associated with gas firing requires a refractory with high conductivity to withstand high thermal stresses. E. J. Pyrcioch

Inhibitors

Blair, C. M. SEMIPOLAR ORGANIC INHIBITORS CHECK CORROSION. *Oil Gas J.*, 52, 148 (1954) February 15.

Semipolar organic inhibitors greatly reduce corrosion in petroleum-handling facilities. Effective reagents generally consist of a large hydrocarbon radical with a polar group that contains elements such as oxygen, sulfur, or nitrogen. This inhibitor is adsorbed upon the surface of the metal, inactivating it from the corrosive medium, and presents a barrier to the migration of hydrated hydrogen ions or other solutes to the surface of the metal.

A. J. Tulis

Muir, P. D. ORGANIC INHIBITORS. *Oil Gas J.*, 52, 143, 145-147 (1954) February 15.

For corrosion protection, liquid inhibitors are injected into wells by three common methods: 1) batch dumping down the casing, 2) pumping inhibitor into tubing and either allowing gravity, or displacement by oil behind it to reach bottom, and 3) pumping inhibitor into casing, allowing it to reach inside of the tubing by means of chemical injection valves near the bottom. Solid sticks that dissolve slowly to free an inhibitor component are also in use. Achievement of protection is indicated by various tests, including iron content of produced water, the coupon test (insertion into the flow line of a test metal plate) and the tubing-caliper survey, by which any pitting occurring in the tubing can be readily located. A. J. Tulis

Refractories

German, W. L. ZIRCON AND ZIRCONIA. *Ceramics*, 60, 540-544 (1954) February.

Applications and properties of zirconia, ZrO_2, and zircon, $ZrSiO_4$ are presented. Beach sands are a source for both materials. Zirconia is formed by thermal dissociation of zircon above 1705°C.; $ZrSiO_4 = ZrO_2 + SiO_2$. In addition to other uses, zircon and zirconia are finding increasing use in refractory materials. Zircon has no definite melting point but has a stated service limit of 1750°C. Its low, regular expansion makes it desirable for refractory use. Zirconia is superior to zircon as a refractory, with a service limit of 2500°C. and a melting point of 2700°C. Stabilization of zirconia, which undergoes a reversible change in crystal-

line form at 1000°C., is achieved by adding small amounts of calcium, magnesium or titanium oxides. The stabilized zircon has good resistance to thermal shock and is chemically fairly inert at high temperatures. Zircon has a specific gravity of 4.6 and stabilized zirconia a specific gravity of 5.6. Other uses for the zirconium compounds are: glazes and enamels; precision casting; abrasives; ceramic colors; and electroceramics. E. J. Pyrcioch

Salt Corrosion

CORROSIVE EFFECTS OF DEICING SALTS. *Corrosion*, 10, 3-6 (1954) January.

Although relatively little quantitative data is available to state definitely the rate of corrosion due to the deicing salts (mostly NaCl), it is an established fact that those salts increase the corrosion of metallic equipment a great deal both above and below the ground surface, thus causing an economic loss of $100,000,000 annually, especially for the Northern part of the United States. A survey made in 1952 showed that mixing a polyphosphate-type inhibitor with the salts would reduce its damaging effects. This was true in two out of three cities. The laboratory tests, with inhibitor concentration of 2 lb. per 100 lb. of rock salt, proved to decrease the corrosion considerably. The problem is a complex one and still at its early stages of study. The few hints given for investigation of damages are nothing new to automobile owners. S. Sensi

13. NEW BOOKS

Coal Gasification

INCREASED THERMAL EFFICIENCY OF SOLID FUEL THROUGH GASIFICATION. Organ. European Econ. Co-Opern. Doc. No. PRA/CR/WP3(53)1, 103 pp. Paris (1954) February.

Descriptions and operating data are given for semi-commercial and laboratory-scale solid fuel gasification processes, which are presently under development in Europe and in the United States. Consideration is given to fuel characteristics and methods of heating as these affect the operability and efficiency of the various gasification methods. Included among the processes are the Gas Research Board and ICI fluidized systems; the U. S. Bureau of Mines, Institute of Gas Technology, Texas Co., Panindco and Koppers-Totzek suspension gasification methods using pulverized fuels; the U. S. Bureau of Mines vortex gasifier and the pulsatory combustion tube, both operating with pulverized coal. Research work conducted by Ruhrgas and Gaz de France is also briefly described. Experimental data are summarized in several appendices to this publication.

C. G. von Fredersdorff

Gas Engineering

THE PROFESSION OF GAS ENGINEERING. Inst. Gas Eng. (British) Comm. No. 433 (1954) January.

This little booklet represents one of the Institution of Gas Engineers efforts to induce young men and women into courses in the gas industry in Great Britain. A brief outline of the development of the gas industry, of the manufacture and distribution of gas, of scientific and engineering position, and of training facilities is given. R. F. Bukacek

Gaseous Fuels

Shnidman, L., Editor. GASEOUS FUELS, PROPERTIES, BEHAVIOR, AND UTILIZATION. Second Edition. 453 + xvii pp. Amer. Gas Assoc., New York (1954).

This volume is considerably more than a reprinting, as it represents a corrected and revised revision of its predecessor plus four new chapters and several new tables and diagrams. A chapter on recent technical developments discusses purging practices for LP-gases, catalytic reforming, odorization and corrosion among other things. A chapter on selection of oils for gas production presents a condensation of Institute of Gas Technology Bulletins 9 and 12. Another new chapter presents recent developments and researches on the interchangeability of fuel gases with much data secured with the Rochester test burner, a section on the Bureau of Standards interchangeability J-indexes, and the Bureau of Mines concept on critical boundary velocity and flame stability charts. The final chapter presents a summary of recent and active PAR research projects.

R. Ellington

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Bituminous Coal Research
Brennstoff-Chemie
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Butane-Propane News

California Oil World
Canadian Chemical Processing
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Chemical Engineering Progress
Chemical Engineering Science
Chemical Processing
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Chemical Society (London) Journal
Chemical Week
Chemist
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Chemistry and Industry
Coal Heat
Coke and Gas
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Compressed Air
Construction Methods and Equipment
Corrosion
Current Chemical Papers (Chem. Soc., London)

Electronics
Endeavour
Engineers' Digest
Erdöl und Kohle

Faraday Society. Transactions
Fuel
Fuel Abstracts
Fuel Economist
Fueloil and Oil Heat

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Gas and Oil Power
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Gas Journal
Gas News (Chicago)
Gas Council Publications
Gas Times
Gas und Wasserfach
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Heating and Ventilating
Heating, Piping and Air Conditioning

Independent Petroleum Association of America Monthly
Industrial and Engineering Chemistry
Industrial Finishing
Industrial Gas (American)
Industrial Gas (British)
Industrial Heating
Institute of Fuel (British). Journal
Institute of Petroleum (British). Journal
Institute of Gas Technology Publications
Institution of Gas Engineers. Bulletins, Communications and Transactions
Instruments

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Journal of Applied Chemistry
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National Advisory Committee for Aeronautics, Reports
National Fire Protection Association Quarterly
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Official Gazette of the U.S. Patent Office
Oil and Gas Journal
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Optical Society of America. Journal

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